SAMPLE QUESTION PAPER 01

Class-X (2017–18)

Mathematics

Time allowed: 3 Hours **Max. Marks: 80**

General Instructions:

(i) All questions are compulsory.

(ii) The question paper consists of **30** questions divided into four sections **A, B, C and D.**

(iii) Section **A** contains **6** questions of **1** mark each. Section **B** contains **6** questions of **2** marks each. Section **C** contains **10** questions of **3** marks each. Section **D** contains **8** questions of **4** marks each.

(iv) There is no overall choice. However, an internal choice has been provided in four questions of 3 marks each and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.

(v) Use of **calculators** is not permitted.

Section-A

1. Can two numbers have 18 as their HCF and 380 as their LCM? Give reason.

2. Find the root of the equation $16x - \frac{10}{x} = 27$.

3. Determine whether 50cm, 80cm, 100cm can be the sides of a right triangle or not.

4. The length of the shadow of a man is equal to the height of man. The angle of elevation is ________.

5. If the perimeter and area of a circle are numerically equal, then find the radius of the circle.

6. If three coins are tossed simultaneously, then find the probability of getting at least two heads.

Section-B

7. Is 7× 6 × 5 × 4 × 3 × 2 × 1+ 5 a composite number? Justify your answer.

8. The 11^{th} term of an A.P. exceeds its 4^{th} term by 14. Find the common difference.

9. Find the relation between 'x' and 'y', if the points$(x,\ y)$, (1,2) and (7,0) are collinear.

10. Two tangents making an angle of 120° with each other are drawn to a circle of radius 6 cm, find the length of each tangent.

11. Prove that $\sec^2\theta + \mathrm{cosec}^2\theta = \sec^2\theta.\mathrm{cosec}^2\theta$

12. A cone of height 20 cm and radius of base 5 cm is made up of modelling clay. A child reshapes it in the form of a sphere. Find the diameter of the sphere.

Section-C

13. Use Euclid's division lemma to show that cube of any positive integer is either of the form 9q, 9q+1 or 9q + 8 for some integer 'q'.

14. Obtain all other zeroes of $x^4 + 5x^3 - 2x^2 - 40x - 48$ if two of its zeroes are $2\sqrt{2}$ and - $2\sqrt{2}$

15. Solve for 'x': $\frac{1}{2a+b+2x} = \frac{1}{2a} + \frac{1}{b} + \frac{1}{2x}$, x ≠ 0.

16. How many terms of the series 54, 51, 48,.......be taken so that their sum is 513? Explain the double answer.

Or

In an AP p^{th}, q^{th} and r^{th} terms are respectively a, b and c. Prove that
p(b - c) + q(c - a) + r(a - b) = 0

17. The point A(3, y) is equidistant from the points P(6,5) and Q(0, -3). Find the value of y.

Or

If A (4, 6), B (3, -2) and C (5, 2) are the vertices of Δ ABC, then verify the fact that a median of a triangle ABC divides it into two triangles of equal areas.

18. If $\cos\theta - \sin\theta = \sqrt{2}\sin\theta,$ prove that $\cos\theta + \sin\theta = \sqrt{2}\sin\theta$

19. An observer 1.5m tall is 28.5m away from a chimney. The angle of elevation of the top of

the chimney from her eyes is 45°. What is the height of the chimney?

Or

From the top of a 7m high building, the angle of elevation of the top of a cable tower is 60^o and the angle of depression of the foot of the tower is 30^o. Find the height of the tower.

20. A boy is cycling such that the wheels of the cycle are making 140 revolutions per minute. If the diameter of the wheel is 60 cm, calculate the speed in Km per hour in which the boy is cycling.

21. The following table shows the gain in weight by 50 children in a year. Calculate modal gain in weight.

Gain in weight (in kg)	1 - 3	3 - 5	5 - 7	7 - 9	9- 11	11-13
No. of children	4	6	10	18	7	5

Or

Compute the Median for the given data

Class –interval	100-110	110-120	120-130	130-140	140-150	150-160
Frequency	6	35	48	72	100	4

22. What is the probability that a leap year, selected at random will contain 53 Thursdays?

Section-D

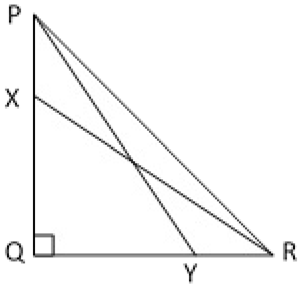
23. Solve graphically the following equations 2x + 3y = 9; x – 2y =1. Shade the region bounded by the two lines and the x axis.

Or

Check graphically whether the pair of equations x + y = 8 and x – 2y = 2 is consistent. If so, solve them graphically. Also find the coordinates of the points where the two lines meet the y-axis.

24. A thief away from a Police Station with a uniform speed 100m/minutes. After one minute a Policeman runs behind the thief to catch him. He goes at a speed of 100m/minute in first minute and increases the speed 10m/minute on each succeeding minute. After how many minutes the Policeman catches the thief.
Now answer these questions:
(i) Which mathematical concept is being used to solve the above problem?
(ii) Which trait of personality of the policeman is showed?

25. In the adjoining figure, PQR, is a right triangle, right angled at Q. X and Y are the points on PQ and QR such that PX : XQ = 1 : 2 and QY : YR = 2 : 1. Prove that $9(PY^2 + XR^2) = 13\ PR^2$



Or

A quadrilateral ABCD is drawn to circumscribe a circle (fig-2). Prove that, AB + CD = AD + BC.

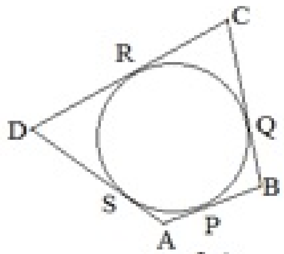


fig-2

26. Prove that the lengths of two tangents drawn from an external point to a circle are equal.

27. Construct an isosceles triangle whose base is 7cm and altitude 5 cm and then construct another triangle whose sides are $\frac{3}{4}$ times the corresponding sides of the isosceles triangle.

28. Suppose a person is standing on a tower of height $15(\sqrt{3}+1)$m and observing a car coming towards the tower. He observed that angle of depression changes from 30° to 45°, in 3 seconds. Find the speed of the car.

29. A container opens at the top and made up of metal sheet is in the form of a frustum of a

cone of height 16cm with diameters of its lower and upper ends as 16cm and 40cm respectively. Find the cost of metal sheet used to make the container, if it costs Rs.10 per $100cm^2$. (Use π=3.14)

30. The mean of the following frequency distribution is 47. Find the value of ‘p’.

Classes	**0 - 20**	**20 - 40**	**40 - 60**	**60 - 80**	**80 - 100**
Frequency	8	15	20	p	5

Or

Compute the mode for the following frequency distribution.

Size of items:	0-4	4-8	8-12	12-16	16-20	20-40	24-28	28-32	32-36	36-40
Frequency:	5	7	9	17	12	10	6	3	1	0

CBSE SAMPLE PAPER 01

CLASS X MATHEMATICS

Marking Scheme

1. No. Because HCF is always a factor of LCM but here 18 is not a factor of 380.

2. $16x^2 -27x-10=0$

$(16x + 5) (x - 2)=0$

$x= \frac{-5}{16}$, $x = 2$

3. $50^2 + 80^2 \neq 100^2$

Clearly, the sum of the squares of the lengths of two sides is not equal to the square of the length of the third side. Hence, given sides do not make a right triangle because it does not satisfy the property of Pythagoras theorem.

4. 45°

5. Perimetre of the Circle = Area of the Circle

$2\pi r = \pi r^2$

$2 = \text{r}$

6. Number of possible outcomes = 8 (HHH, HHT, HTH,HTT, THH, THT, TTH, TTT)

Number of favorable outcomes (2 head) = 4

So probability = $\frac{4}{8} = \frac{1}{2}$

7. Yes, 5040 + 5 = 5045 It has more than two factors

8. Let the first term of AP is a and d is common difference then According to Question

$a_{11} – a_4 =14$;

=> a + 10d – (a + 3d) = 14

=> a + 10d - a - 3d = 14

=> 7d = 14

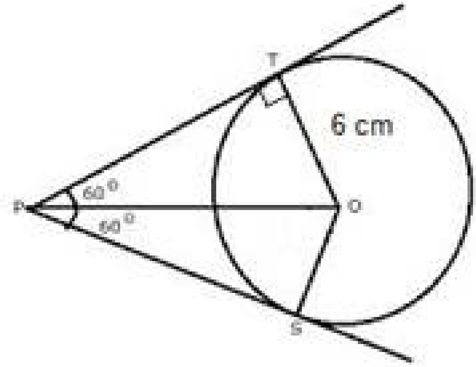
=> d=2

9. $\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)] = 0$\; [collinear]

$\frac{1}{2}[x(2-0)+1(0-y)+7(y-2)]=0$

x = 7 – 3y

10.



PT=PS (length of tangents)

$\angle OPT = 60°$

ΔOTP tan 60°= $\frac{6}{PT}$

PT= $2\sqrt{3}$ cm

11. LHS = $\sec^2\theta + \text{cosec}^2\theta$

$= \frac{1}{\cos^2\theta} + \frac{1}{\sin^2\theta}$

$= \frac{\sin^2\theta+\cos^2\theta}{\sin^2\theta.\cos^2\theta}$

$= \frac{1}{\sin^2\theta.\cos^2\theta}$

$= \text{cosec}^2\theta.\sec^2\theta$

= RHS

12. Volume of cone = Volume of sphere

$\frac{1}{3}\pi r^2 h = \frac{4}{3}\pi r^3$

$\frac{4}{3}\pi r^3 = \frac{1}{3}\pi 5^2 20$

r = 5 cm

13. a = bq + r ; b =3 ; r = 0, 1, 2

a^3 =(3m)^3

= 9 (3m^3)

= 9 q

a^3 =(3m+1)^3

= 27m^3 + 27 m^2 + 9m +1

= 9 q + 1

a^3 =(3m+2)^3

= 27m^3 + 54 m^2 + 18 m +8

= 9 q + 8

14. Two zeroes are $2\sqrt{2}$ and - $2\sqrt{2}$

Therefore $(\mathrm{x}-2\sqrt{2})(\mathrm{x}+2\sqrt{2})=0$

i.e.$\mathrm{x}^2-8=0$

$(\mathrm{x}^4+5\mathrm{x}^3-2\mathrm{x}^2-40\mathrm{x}-48)\div(\mathrm{x}^2-8)$

$=\mathrm{x}^2+5\mathrm{x}+6$

Another factor is $\mathrm{x}^2+5\mathrm{x}+6=0$

$(\mathrm{x}+2)(\mathrm{x}+3)=0$

$\mathrm{x}=-2$ and $\mathrm{x}=-3$

15. $\frac{1}{2\mathrm{a}+\mathrm{b}+2\mathrm{x}}-\frac{1}{2\mathrm{x}}=\frac{1}{2\mathrm{a}}+\frac{1}{\mathrm{b}}$

$\implies \frac{2x-2a-b-2x}{2x(2a+b+2x)}=\frac{2a+b}{2ab}$

$\implies \frac{-1}{x(2a+b+2x)} = \frac{1}{ab}$

=> $2x^2 + 2ax + bx + ab = 0$

=> 2x(x+a) + b (x+a) = 0

=> (x+a) (2x+b) = 0

=> x = -a , $\frac{-b}{2}$

16. a = 54 , d= -3 , s_n = 513

$S_n = \frac{n}{2}[2a + (n-1)d]$

$513 = \frac{n}{2}[108 + (n-1)(-3)]$

=> $n^2 - 37n + 342 = 0$

$\Rightarrow$ n = 18 , 19

Since d is negative. we get double answer because sum of 18 terms and 19 terms is zero, as few terms are positive and few are negative.

Or

A + (p - 1)D = a..(i)

A + (q-1) D=b.... (ii)

A + (r-1) D=c... .... (iii)

(ii) - (iii)

b - c = (q-1) D –(r-1)D

$\Rightarrow b - c = D(q-r)$

$\Rightarrow p(b-c) = p\ D(q-r)........(iv)$

Similarly,

$q(c-a)=q \quad D(r-p)..........(v)$

$r(a-b)=r \quad D(p-q)...........(vi)$

Adding (iv), (v) and (vi)

$p(b-c)+q(c-a)+r(a-b)=0$

17. PA =QA 17. The point A(3, y) is equidistant from the points P(6,5) and Q(0, -3). Find the value of y.

$\sqrt{(3-6)^2+(y-5)^2}$

$= \sqrt{(3-0)^2+(y-(-3))^2}$

$$\implies 9+y^2+25-10y=9+y^2+9+6y$$
$$\implies 16y=16$$
$$\implies y=1$$

18. $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$

$\Rightarrow \cos\theta = \sqrt{2}\sin\theta + \sin\theta$

$= (\sqrt{2}+1)\sin\theta$

$= (\sqrt{2}+1)\sin\theta$

$= (\sqrt{2}+1)\frac{(\sqrt{2}-1)}{\sqrt{2}-1}.\sin\theta$

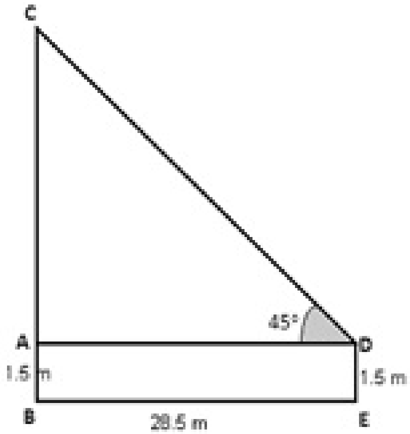
$= \frac{2-1}{\sqrt{2}-1}.\sin\theta$

$\Rightarrow (\sqrt{2}-1).\cos\theta = \sin\theta$

$\Rightarrow (\sqrt{2}-1).\cos\theta = \sin\theta$

$\Rightarrow \sqrt{2}\cos\theta = \sin\theta + \cos\theta$

19.



Given the height of the observer be DE = 1.5 m

That is AB = 1.5 m

Let BC = h is height of the chimney

Hence AC = (h – 1.5) m

Given distance between the observer and the chimney is

AD = BE = 28.5 m

In right triangle DCA, θ = 45°

$$\tan 45° = \frac{AC}{28.5\;m}$$

∴ h = 28.5 +1.5 = 30 m

Thus the height of the chimney is 30 m.

20. Circumference of wheel = πd = 60 π cm

Distance covered in 1 revolution = $\frac{22\times60}{7\times100\times1000}$ km

Distance covered in 140 revolution = $\frac{22\times60}{7\times100\times1000}$ km

(Distance covered in 1 min)

Distance covered in 1 hr = $\frac{22\times60}{7\times100\times1000}\times 140km$

Speed of cycle = 15.84 km / hr

21. Modal class = 7 - 9

Mode-

$7 + \frac{18-10}{36-10-7} \times 2$

= $7 + \frac{16}{19} = 7 + 0.84 = 7.84$

22. There are 366 days in a leap year that contain 52 weeks and 2 more days. So, 52 Thursdays and 2 days.

These 2 days can be:

(Mon, Tue}, {Tue, Wed}, {Wed, Thu}, {Thu, Fri}, {Fri, Sat}, {Sat, Sun} and {Sun, Mon} (7 cases).

In order to have 53 Thursdays we should have either {Thu, Fri} or {Wed, Thu} case.

No. of sample spaces = 7.

No. of event that gives 53 Thursdays in a leap Year = 2.

Required Probability = $\frac{2}{7}$

23.

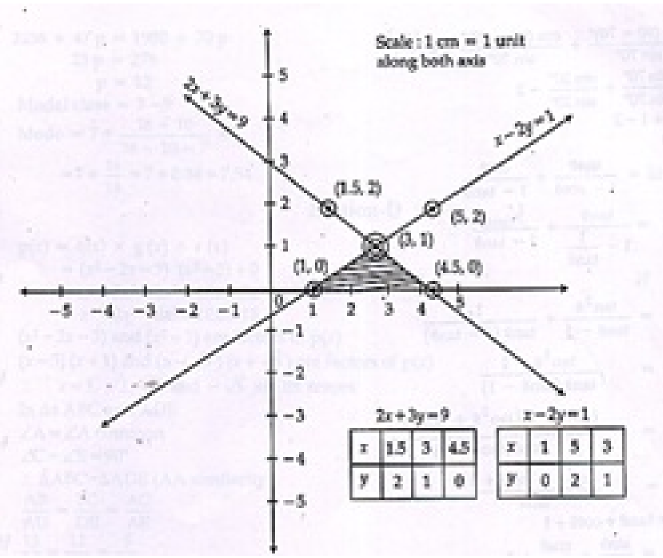


Table for Eqn.1 and its line

Table for Eqn.2 and its line

Solution x =3 and y =1

Shaded area is required solution.

Or

$x + y = 8 \ \cdots \ (i)$

x	0	4	8

y = 8 –x	8	4	0

Three solutions for equation (i)are given in the table :

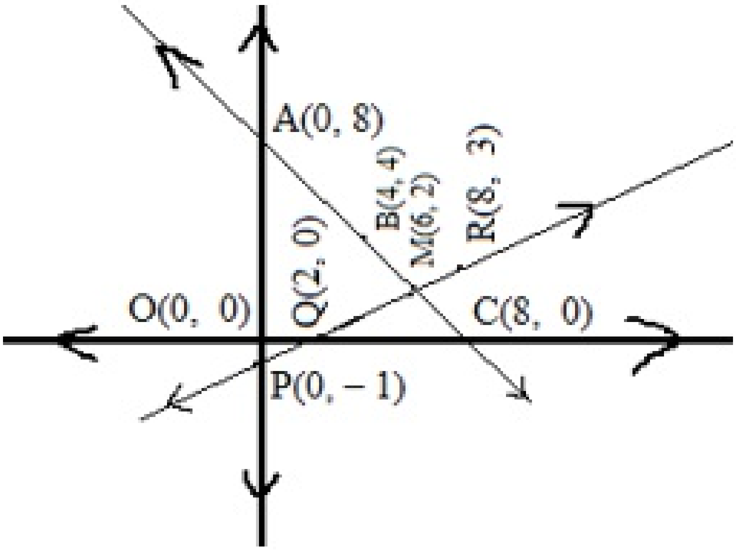
$$x - 2y = 2 \quad \cdots \quad (ii)$$

Three solutions for equation (ii) are given in the table :

x	0	2	8
$y = \frac{x-2}{2}$	–1	0	3

Drawing Line AC

Drawing Line PR



Plotting points A(0, 8), B(4, 4) and C(8, 0) on graph paper the straight line AC is obtained as graph of the equation
(i) Plotting points P(0, –1), Q(2, 0) and R(8, 3) on graph paper the straight line PR is obtained as graph of the equation
(ii). From the graph, it is clear that a point M(6, 2) common to both the lines AC and PR.

So the pair of equations is consistent and the solutions of the equations are x = 6 and y = 2. From the graph it is seen that the coordinates of the points where the lines AC and PR meets the y-axis are (0, 8) and (0, –1) respectively.

24. Time taken by Thief before being caught = n+1

Distance travelled by Thief = 100 (n+ 1)

100 (n+1) = $\frac{n}{2}\left[2\times 100+(n-1)10\right]$

$\implies 200n+200=n(200+10n-10)$

$\implies 10n^2+190n-200n-200=0$

$\implies 10n^2-10n-200=0$

$\implies n^2-n-20=0$

$\implies (n-5)(n+4)=0$

n = 5 minutes

i) Arithmetic Progression

ii) Responsibility of their work (duty) and honesty

25. Join XY

$\mathrm{XY}||\mathrm{PR}$

$\Rightarrow \Delta\mathrm{PQR}\sim\Delta\mathrm{XQY}$

$\Rightarrow \frac{\mathrm{XY}}{\mathrm{PR}}=\frac{2}{3}$

$\mathrm{PY}^2+\mathrm{XR}^2=(\mathrm{PQ}^2+\mathrm{QR}^2)+(\mathrm{QY}^2+\mathrm{QX}^2)=\mathrm{PR}^2+\mathrm{XY}^2$

$=\ \mathrm{PR}^2+\frac{4}{9}\mathrm{PR}^2$

$\Rightarrow 9(\ \mathrm{PY}^2+\mathrm{XR}^2)=13\mathrm{PR}^2$

Or

Since, the lengths of tangents drawn from an external point to a circle are equal.

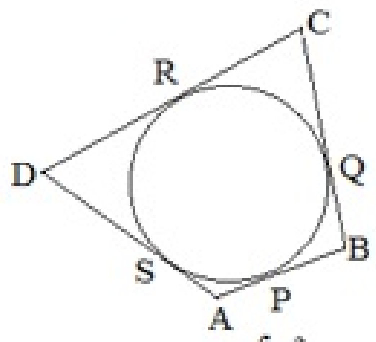


fig-2

AP = AS ... (i) BP = BQ ... (ii)

CQ = CR ... (iii) DR = DS ... (iv)

Now, AB + CD

= AP + PB + CR + RD

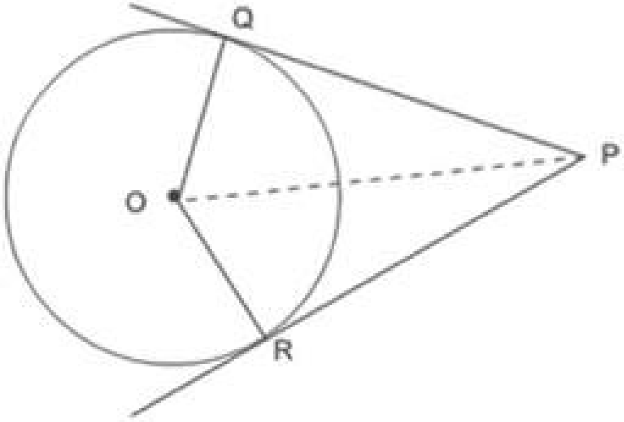
= AS + BQ + CQ + DS

= (AS + DS) + (BQ + CQ)

= AD + BC

Hence proved.

26. **Construction:** Draw a circle with centre O. From a point P outside the circle, draw two tangents P and R.



To Prove: PQ = PR

Proof: In Δ POQ and Δ POR

OQ = OR (radii)

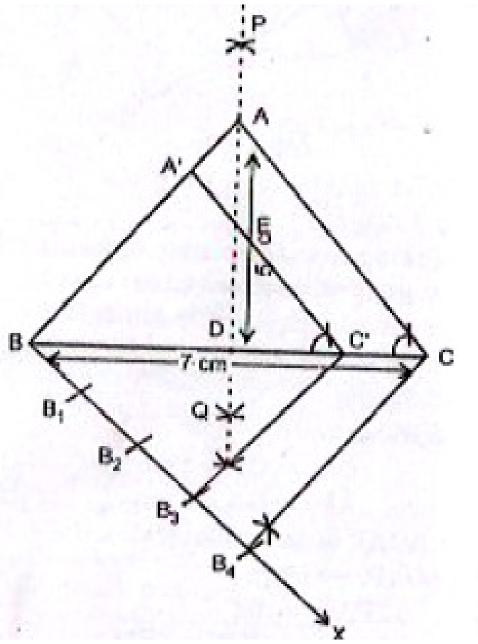
PO = PO (common side)

∠PQO = ∠PRO (Right angle)

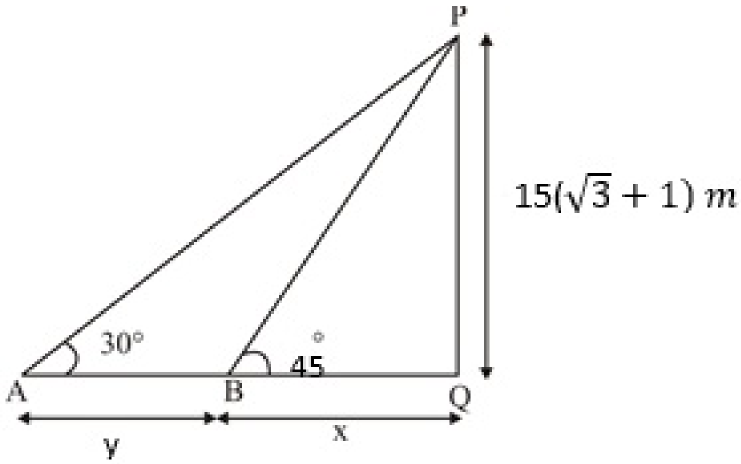
Δ POQ ≅ Δ POR (By RHS Congruency rule)

Hence proved

27.



28.



Δ PQB tan 45° = $\frac{PQ}{BQ}$, x= 15$(\sqrt{3}+1)$\;m ------------ (1)

Δ PQA tan 30° = $\frac{PQ}{AQ}$ x + y = 15$\sqrt{3}(\sqrt{3}+1)$\;m--------- (2)

From (1) and (2) y = 30 m

Since the car moving from A to B in 3 seconds

Speed = $\frac{\text{Distance}}{\text{Time}}$ = 10 m / sec

29. R = 20 cm , r = 8 cm , h= 16 cm

l = $\sqrt{h^2 + (R - r)^2}$ = 20 cm

Total surface area = CSA of frustum + area of base

= $\pi l(R+r) + \pi r^2$

= 1959.36

Rate of metal sheet used = Rs.10 per 100 cm^2

Cost of metal sheet used = 1959.36 × $\frac{10}{100}$ = Rs.195.94 (Approximately)

30.

CI	**f_i**	**x_i**	**f_ix_i**
0 - 20	8	10	80
20 - 40	15	30	450
40 - 60	20	50	1000
60 - 80	p	70	70p
80 - 100	5	90	450
	48+p		**1980+70p**

$47 = \frac{1980+70\text{p}}{48+\text{p}}$

$\Rightarrow 2256 + 47\text{p} = 1980 + 70\text{p}$

$\Rightarrow 23\text{p} = 276$

$\Rightarrow \text{p} = 12$